Translation Paper Number Fifteen

Energy and Smart Growth:
It's about How and Where We Build

Funders' Network
For Smart Growth and Livable Communities

This paper was commissioned by the Funders' Network for Smart Growth and Livable Communities. The collaborating author on this paper was Naomi Friedman[1], a consultant to the Environmental and Energy Study Institute.** This is the fifteenth in a series of translation papers published by the Funders' Network to translate the impact of sprawl and urban disinvestment upon issues of importance to our communities and environment and to suggest opportunities for progress that would be created by smarter growth policies and practices. Other issues addressed in the series of translation papers include water, community development, arts, health, biodiversity, children and families, education, aging, transportation, agriculture, civic engagement, parks and open space, workforce development, and social equity.*

** The Funders' Network works to strengthen and expand funders' abilities to support organizations working to build more livable communities through smarter growth policies and practices. For more information, visit www.fundersnetwork.org.*

*** The Environmental and Energy Study Institute (EESI), a nonprofit organization based in Washington, D.C., works at the nexus of public policy and environmental and energy innovation to promote sustainable societies. Established in 1984 by a bi-partisan group of Members of Congress, EESI catalyzes change in policy and practice by educating decision-makers; connecting stakeholders; and developing innovative, integrated solutions. For more information, visit www.eesi.org.*

Abstract

By efficiently locating development, smarter growth land use policies and practices offer a viable way to reduce U.S. energy consumption. Moreover, by increasing attention on how we build, in addition to where we build, smart growth could become even more energy smart. The smart growth and energy efficiency movements thus are intrinsically linked, yet these two fields have mostly operated in separate worlds. Through greater use of energy efficient design, and renewable energy resources, the smart growth movement could better achieve its goals of environmental protection, economic security and prosperity, and community livability. In short, green building and smart growth should go hand in hand. Heightened concern about foreign oil dependence, climate change, and other ill effects of fossil fuel usage makes the energy-smart growth collaboration especially important. Strengthening this collaboration will involve overcoming some hurdles, however, and funders can play an important role in assisting these movements to gain strength from each other.

This paper contends there is much to be gained by expanding the smart growth movement to include greater attention on energy. It provides a brief background on current energy trends and programs, relevant to smart growth. It then presents a framework for understanding the connections between energy and land use which focuses on two primary issues: how to build, which involves neighborhood and building design, and where to build, meaning that location matters. The final section offers suggestions to funders interesting in helping accelerate the merger of these fields.

Introduction

Not since the early 1970s have energy issues consumed as much national attention. From California's rolling blackouts and deregulation problems, to concerns about the environmental and public health effects of energy use, to present national security interest in reducing dependence on foreign oil, energy issues are near the top of the public policy agenda. Yet a critical piece missing from present energy discussions is the recognition of the role that land use decisions play in current energy policy. The way communities are designed, planned, and built has significant influence over the amount of energy used, how energy is distributed, and the types of energy sources that will be needed in the future. In addition, daily decisions concerning how and where to build communities can help or hinder national goals of energy efficiency and energy independence.

"Smarter growth" land use policies and practices—that advocate more compact and mixed use communities, more transportation options, and the preservation of green space[2]—have the potential to decrease reliance on fossil fuels and increase ability to respond to volatile energy prices. While development built according to smart growth principles is inherently more efficient than conventional development, it could become even smarter through greater use of energy efficient designs and local renewable energy sources.

"Energy smart" land use decisions—that focus on energy efficient neighborhood and building design as well as efficient locations—could reduce vulnerability to energy supply and price spikes, lessen air pollution associated with fossil fuel combustion, reduce greenhouse gas emissions, and increase the affordability of housing and commercial space by reducing operating costs. Another benefit could be the ability to attract new constituent groups to the smart growth field. Energy managers, utilities, and organizations engaged in greenhouse gas reduction are an untapped group that could add influence, new ideas, and power to the smart growth movement. By considering energy demand and supply, energy efficient design, and transportation energy use, the environmental, economic, and social goals of smart growth can be more effectively achieved. As Jim Schwab of the American Planning Association recently stated, "In an era when 'smart growth' is the common mantra, it may be worth considering that smart growth must, of necessity, be energy-efficient growth. Taking stock of how that equation can best be realized, however, will be no small challenge."[3]

Funders can play an important role in helping states and communities connect "energy smart" with smart growth through the development of new research and information, integrated planning tools, policy incentives, and increased communication and coordination. Funders can help to facilitate dialogue among land use planners, transportation planners, energy managers, community development advocates, and experts in renewable energy and green building design, in order to determine how best to move this collaboration forward.

Understanding Energy Demand: The Energy Landscape

Before addressing ways to better connect smart growth and energy, it is important to understand how and where energy is currently being used. Residential buildings, commercial buildings, and the transportation of people and freight use the majority of the energy consumed by the United States each year.[4] Specifically, the industrial sector uses 38 percent of total energy, closely followed by the transportation sector at 28 percent, the residential sector at 19 percent, and the commercial sector at 16 percent. On a community level, transportation can account for 40 to 50 percent of total energy use, and residential buildings use another 20 to 30 percent.

The American way of life today is completely dependent on abundant supplies of energy. Energy is needed to heat, cool, and light homes, fuel cars, and power offices. Energy also is critical for manufacturing the products used every day, including the cement, concrete, and bricks that shape our communities. Headlines such as: "Oil Supplies Fall as Nation Shivers," remind us of the important yet precarious relationship between our daily needs and comforts and cheap sources of energy.[5]

While the U.S. represents only five percent of the world's population, it consumes 25 percent of its energy and generates about 25 percent of its greenhouse gas emissions. U.S. citizens, for example, use more energy per capita for transportation than do citizens of any other industrialized nation—which, in part, reflects the greater distances traveled by Americans compared with citizens of other nations.[6]

To satisfy an energy intensive lifestyle, the U.S. has become vastly dependant on fossil fuels. About 85 percent of the energy used in the U.S. comes from fossil fuels—39 percent from oil, 23 percent from coal, and 23 percent from natural gas.[7] This nation consumes 19.7 million barrels of oil per day—which is more oil per day than any other country in the world. While the U.S. consumes 25 percent of the total oil produced each day, it has only two to three percent of the world's known oil reserves. Currently, 55 percent of the oil used in the United States is imported from foreign sources and this percentage is predicted to rise in the coming years.[8]

One alarming problem with the close connection between energy and land use is the relative inflexibility of the built environment in relation to energy shifts. Energy availability and pricing are volatile and dependent on changing political and economic factors. While energy shifts can be quick and capricious, land development patterns can be difficult and expensive to alter. The gas lines of the early 1970s and California's electricity shortages in 2001 are vivid reminders of how quickly the energy landscape can change.

Connecting Smart Growth and Energy Efficiency

Between 1982 and 1997, the amount of land consumed for urban development increased by 47 percent while the nation's population grew by only 17 percent.[9] Inefficient land development practices have increased infrastructure costs as well as the amount of energy needed for transportation, community services, and buildings.

At the same time, a growing number of citizens and government officials have begun advocating a smarter approach to land use planning. These "smart" growth practices include compact community development, multiple transportation choices, mixed land uses, and practices to conserve green space. These programs offer environmental, economic, and quality-of-life benefits; and they also serve to reduce energy usage and greenhouse gas emissions. Yet these latter benefits are not as fully understood or publicized.

Smarter growth land use policies have both a direct and indirect effect on energy consuming behavior. For example, transportation energy usage, the number one user of petroleum fuels, could significantly be reduced through more compact and mixed use land development patterns served by a variety of transportation choices. Improved planning and design could reduce energy demand and also help to increase supply by tapping into renewable energy resources. When we integrate energy considerations into development decisions, we can more effectively address the key way to secure our energy future, which is by reducing energy demand and diversifying supply.

The Role of Government and Infrastructure in Supporting Current Patterns

Government has played an essential role in subsidizing the infrastructure needed to support sprawled land use patterns, leading to inaccurate price signals regarding the true cost of sprawl. Federal subsidies for highway building are an oft-talked about example. Fossil fuel subsidies that mask the true cost of driving are another example. Electricity presents another interesting case. With electricity, there is a cost associated with extending and maintaining the service delivery system, as with water and sewage, but there is also a loss in the commodity being delivered. The farther from the generator, the more power is lost in distribution. According to the Department of Energy's (DOE) Energy Information Administration (EIA), nine percent of energy is lost in transmission.[10] Current average cost pricing, where customers pay the same price per unit of power regardless of the true cost of their service, subsidizes sprawl development.[11] According to Scott Bernstein from the Center for Neighborhood Technology, the cost of the infrastructure required (including water, sewage, electricity) to service a new unit in a greenfield[12] neighborhood is $50,000 to $60,000 per unit, whereas it costs $5,000 to $10,000 per unit in a brown[13] or greyfield.[14] With electricity deregulation, some states now charge customers/developers fees for extending distribution to new locations rather than rolling such costs into utility rates.[15] For example, the box below on the New Jersey State Plan describes New Jersey's program to link infrastructure costs with smart growth.

The New Jersey State Plan

The state of New Jersey has a mandated State Plan that divides the state into five planning areas, some of which are designated for growth, while others are protected. The state is developing a series of incentives to coax local governments into changing zoning laws that will be compatible with the State Plan. The New Jersey Board of Public Utilities recently proposed a revised rule that presents a tiered approach to utility financing. In areas not designated for growth, utilities and their ratepayers are forbidden to cover the costs of extending utility lines to new developments—and developers will be required to pay the full cost of public utility infrastructure. In designated growth areas that have local smart plans endorsed by the State Planning Commission, developers will be refunded the cost of extending utility lines to new developments at two times the rate of the revenue received by developers in smart growth areas that do not have approved plans. (See www.nj.gov/dca/osg/ for more information).

How and Where We Build

One useful way to think about land use and energy is in terms of "how" and "where" we build—"how" concerning the elements of design and "where" involving location issues. Table 1 provides a snapshot of opportunities to improve the connection between energy and smart growth—in macro (location) and micro (subdivision and building) land use decisions.

Table 1: The Relationship between Smart Growth and Energy

"How to Build" – Improved Neighborhood/Building Design

- **Solar street and building orientation** reduces the use of fossil fuels and increases daylighting.
- **Energy efficient design** (including efficiency upgrades and insulation) can reduce energy usage by 30 percent and plays a key role in community development/affordable housing projects.
- **Increased use of shade trees and green space** lessens demand for cooling and can sequester carbon dioxide from the atmosphere.
- **Narrower streets and reduced parking requirements** can reduce the "urban heat island effect" and building cooling costs.
- **Paying attention to where buildings are situated** can maximize opportunities for co-generation (producing energy from waste heat).
- **Solar thermal hot water systems** installed on the rooftops of buildings (such as on existing big box stores) can reduce natural gas and electricity demand for water heating.
- **Solar panels and distributed energy generation** provide electricity back-up and cushion communities from the effects of power outages.
- **Prevention oriented land use and design decisions** can help communities withstand the impacts of extreme weather events, which may be on the rise with the advent of global warming.
- **Greenspace expansion and the preservation of rural and urban forests** allows for sequestration of carbon dioxide from the atmosphere.[16]

"Where to Build" – Location Efficiency

- **Developing areas in or near city centers and public transportation** can reduce vehicle miles traveled and petroleum usage.
- **Locating residential development near commercial development and other services** can increase walking and decrease dependence on automobiles.
- **Directing development away from remote locations** can increase the efficiency of water and electricity distribution and reduce infrastructure subsidization.
- **Siting schools in an efficient location** can increase walking and biking, lessening fuel usage and increasing opportunities for exercise.
- **Integrating land use and energy planning** can increase opportunities to site smaller scale energy facilities closer to customer loads including cogeneration, solar, wind, and fuel cells.

How to Build— Building and Neighborhood Design and Energy

How we build has a significant impact on energy usage, comfort, and performance, while where we build (location) has a significant impact on the amount of energy needed (and green-house gases emitted) to support development.

"How" we build concerns the actual design of neighborhoods including streets, buildings, subdivisions, and transportation facilities. The growth of the New Urbanism movement speaks to this budding interest in building well-functioning and livable places. Increasingly, planners, developers, and designers seek to fashion projects that function well and that also create a good feeling.

Decisions concerning how we build have a direct relationship to energy consumption. Pedestrian friendly, mixed-use neighborhoods that encourage walking and biking to complete daily errands, or allow for combining trips, reduce car trips and related energy usage. Communities in which access to public transportation stations is enhanced can encourage greater usage of public transit and fewer vehicle miles traveled (VMT).

Site selection, orientation, and design greatly affect building energy needs as well as the potential for using alternative sources. Buildings that take advantage of solar access can have a significant affect on energy usage and energy bills. For example, the California-based Local Government Commission examined the subdivision plans of about 30 California counties and found that with improved solar orientation (for passive solar heating, cooling, and daylighting), narrower street widths, and additional tree plantings, developments could achieve significant energy reduction savings (over 20 percent reduction beyond state requirements for minimizing energy use per household) as well as save developers money despite investment in home efficiency upgrades.[17]

Steve Bodzin, formerly with the Congress for the New Urbanism, suggests promoting the energy benefits of energy efficient buildings in terms of increased comfort and quality of life.[18] Drafts and hot and cool zones in traditionally designed homes make residents uncomfortable. Solar orientation and maximum day lighting have been shown to increase comfort as well as worker and student performance.[19] By adopting a more thoughtful approach to orientation and the relationship between buildings, Scott Sklar, a renewable energy expert, suggests that building aesthetics and the livability of public spaces could be enhanced.

Combining New Urbanism and Energy Efficiency in a New Community

Civano, Ariz., is an 818-acre mixed use community in the Tucson area that combines a New Urbanist design with energy efficient features. Homes were designed to use 50 percent less energy than a typical home in the region. Some use solar power to heat water, while others use it to produce electricity. In the hot summer months, some homes actually are receiving credits on their energy bills, as the solar system produces excess energy that is sent back to the electric grid. Civano intends to cluster commercial, cultural, and civic activity around the town center and employ a significant percentage of its residents locally. Tree-lined biking and walking paths and narrower streets with shade trees will create livable neighborhoods with a cooler microclimate. Civano's developers envision the community could become a leader in efficient solar design, enabling the community to attract businesses in the solar energy and renewable energy fields. In January 2004, Sunset *magazine named Civano the Best New Community, proving that energy smart growth could go hand in hand with good design and high aesthetics. (Sources: John Van Gieson, "Making Power Pay," On Common Ground, National Association of Realtors, Winter 2004; and www.civano.com).*

Include Smart Buildings in the Definition and Practice of Smart Growth

A growing number of planners, builders, and advocates believe that growth cannot be considered smart unless it includes both efficient location as well as design. They—and this paper—assert that "smart buildings" should be a more important part of smart growth. In fact, the National Association of Realtors focused their Winter 2004 issue of *On Common Ground* on green building issues.

About 25 to 30 percent of total U.S. energy consumption is used for building operations—such as heating and cooling. Empirical evidence demonstrates there are more and less efficient ways to distribute the same population and thermal demand is a function of geometry, orientation, and density. Smart growth communities tend to concentrate residents in more energy efficient housing due to greater compactness, less floor area, and in some cases—shared walls. In addition to this thermal efficiency there is an opportunity to further reduce building energy consumption through improved design and efficiency and the utilization of renewable energy resources.[20] Energy efficiency creates positive rewards regarding many issues of concern, including housing affordability, air quality, walkable neighborhoods, and social equity, to name a few.

A subdivision of 42 single family homes in Lafayette, Colo., for example, demonstrates how solar design, combined with an energy efficient envelope, can cost-effectively reduce heating bills by about 50 percent in single family homes built on a production scale. The U.S. Department of Energy, for example, has calculated that with more efficient design and the use of energy-efficient technologies, 30 percent—or $100 billion per year in energy costs—could be saved in the 25 million new housing units and 17 billion square feet of commercial develop-

The EcoVillage Cleveland Example:

Integrating Smart Growth, Location Efficiency, and Smart Design

A new development, located in the west side of Cleveland, demonstrates how energy efficient building techniques can be integrated into the latest New Urbanist design. This 20-unit project combines state-of-the-art green building concepts (such as energy efficiency, passive solar design, controlled ventilation, and non-toxic building materials) with pedestrian-friendly streets, mixed uses, and urban greens. EcoVillage is located within a five-minute walk of a rapid transit station currently undergoing major renovation. According to David Rowe, former director of the project, "The new station will be the centerpiece of neighborhood development oriented to transit." The "EcoVillage project, is an example of forward-thinking 'green' approach to urban planning that will become the rule for future redevelopments both in the Greater Cleveland Area and across the country." When complete, the development will include 20 town homes in an ethnically diverse neighborhood where ten single-family homes once stood in disrepair. An adjacent commercial strip and vacant lots will accommodate future development, and existing neighborhood homes also can be rehabbed up to the latest green standards. Detroit Shoreway Community Development Organization, the nonprofit developer, is working in partnership with several organizations including: EcoCity Cleveland, an environmental organization; the Greater Cleveland Rapid Transit Association; developers; the city; and the Cleveland Green Building Coalition. Project funding was received from foundations, the Environmental Protection Agency (EPA), the Department of Energy (DOE), Local Initiatives Support Corporation, National City Bank, and the Solar Electric Power Association. Other organizations are helping to convert adjacent vacant lots into community gardens.

ment the nation is projected to build over the next 15 years (not including the use of active renewable energy). Energy efficiency also has untapped potential in existing homes which represents about 85 percent of housing that will exist in 2020. By 2018, if ten percent of the housing stock met Energy Star[21] efficiency standards (about 30 percent energy reduction), 42 billion pounds of CO_2 would be prevented from entering the atmosphere each year, equivalent to removing over 3.5 million cars from the road.[22]

The "green building" movement, which includes energy efficiency, began before the smart growth movement and has experienced spectacular growth in recent years. For example, membership in the U.S. Green Building Council has doubled every year for the past three years, and 107 projects have received their Leadership in Energy Efficiency and Design (LEED®) certification, with 1,340 buildings registered for LEED review (nearly 165 million square feet of office space or about five percent of total commercial space).[23] [The LEED program (which was first piloted in 1998) certifies buildings based on the number of green points they earn for good site design and selection, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design. Communities, such as Arlington County, Va., provide bonus densities and other incentives to developers that implement eco-friendly building techniques, such as solar orientation, recovery of rainwater for non-drinking purposes, and reflective roofs.]

At the same time, however, much more can be done to assure that green or energy efficient buildings and neighborhood design are institutionalized within smarter growth principles. And this effort is underway. An

Rewarding Smart Growth Through LEED®:
A Partnership to Develop Standards

Natural Resources Defense Council (NRDC), Congress for the New Urbanism (CNU), and U.S. Green Building Council (USGBC) have come together to develop a national set of standards for neighborhood design based on the principles of smart growth. Building on the rating framework for LEED (Leadership in Energy and Environmental Design) Green Building Rating System® (already a standard for environmentally superior buildings), this new partnership will emphasize smart growth aspects of development in addition to incorporating a selection of the most important green building practices. The new rating system, LEED for Neighborhood Developments (LEED-ND), will be designed to provide an objective basis for which to certify "smart" developments. It will create a label, along with guidelines for decision-making, that will serve as an incentive for better location, design, and construction of new residential, commercial, and mixed developments. The standards will be informed by the Smart Growth Network's ten principles for smart growth and other relevant guidance and will include factors such as density, proximity to transit, regional location, diversity of uses and housing type, and pedestrian- and bicycle-friendly design. The goal for LEED-ND is to encourage more sustainable development patterns, similar to the LEED rating system on new construction work, in order to revitalize existing urban areas, reduce land consumption, reduce vehicle miles traveled, improve air quality, decrease polluted stormwater runoff, and build communities where people of a variety of income levels can co-exist, and where jobs and services are accessible by foot or transit. Further, the continued use of certain green building standards in LEED-ND will ensure that indoor air quality is healthier, energy and water consumption decrease, and corresponding utility bills of tenants and residents decrease as well. Additional information about LEED-ND is available by contacting nd@committees.usgbc.org. (Source: "Rewarding Smart Growth Through LEED: A Partnership to Develop Standards" fact sheet).

exciting new partnership, between the U.S. Green Building Council, the Congress for the New Urbanism, and the Natural Resources Defense Council, seeks to create a new certification program (i.e., an expansion of the LEED program) that puts greater emphasis on neighborhood design, location, access to infrastructure, and other smart growth qualities in addition to green building features. See the box on page 8 for more information on the effort to develop a new LEED standard for neighborhood design (LEED-ND).

There is much value in expanding the definition of smart growth and New Urbanism to include energy efficient design (and renewable energy resources). In addition to the environmental and energy benefits, several surveys have indicated that energy efficiency improvements may increase real estate values as residents are willing to pay extra for energy—and resource-efficient features.[24] Policies to bridge the gap between smart growth and energy efficiency could include requiring minimum standards such as the International Energy Conservation Building Code. The proposed New Jersey Smart Growth Tax Credit presents one effort to merge smart growth goals with energy efficient and green building design. This program would encourage developers to invest in appropriately located, energy efficient residential and mixed use construction projects that minimize land and water impacts, are pedestrian friendly, and facilitate use of public transportation. Additional incentives would be available for projects that locate in especially transit-rich areas, include LEED certified buildings, or meet other "extra credit" criteria.

Consider Energy Efficiency as an Affordable Housing/Community Development Strategy

Another entry point for energy efficiency is the affordable housing market—a key challenge of smart growth and urban redevelopment. As demand for housing in the city increases, prices typically rise. One way to address issues of dislocation and gentrification is to reduce housing costs through energy efficiency measures. Lowering household expenses through a reduction in transportation costs (such as car ownership and maintenance), which is discussed in more detail later, can be quite effective; so is reducing utility bills. According to the Environmental Resources Trust, energy bills are one key reason that lower-income families cannot afford to stay in their homes.[25] In the United States, poorer families can pay a sizable percentage of their income for energy, about 12 to 26 percent of their household budget, often due to living in inefficient homes.[26]

There are a number of programs to try to reduce the energy bills of lower-income families, some of which are targeted at design improvements. The key, of course, is to ensure that new designs do not significantly increase prices. Twenty-two energy-efficient/passive solar row houses built in North Philadelphia in the mid-1980s demonstrate how significant energy savings can be achieved at no extra cost. The row houses, sold to low- and moderate-income first-time homebuyers, require almost two-thirds less energy to heat, compared with conventional row houses. *The New York Times* recently reported that government agencies are offering incentives to developers who install energy-saving measures and that green features are now appearing in affordable housing efforts in places like Harlem and the Bronx.[27] Through more coordinated work between economic development lenders and investors and energy experts, additional investments can be made on making inner city housing more energy efficient and thus affordable.

Several organizations are moving in this direction. The Enterprise Foundation, a leading national community development intermediary, is now exploring how to integrate green building designs into all of its projects. Global Green USA (a program affiliated with Green Cross International and led by President Mikhail Gorbachev) seeks to promote the design, construction, rehabilitation, and maintenance of resource efficient affordable housing. Habitat for Humanity, in partnership with the U.S. Department of Energy, provides education and training on energy efficiency so that

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homeowners will be able to direct more of their money to important needs such as food and medicine. Finally, a new program, known as Weatherization, Rehab and Asset Preservation Partnership (WRAP), funded by the Ford Foundation, is consolidating and strengthening the delivery of energy efficiency assistance to lower income households in 12 pilot neighborhoods.

There is significant opportunity to invest clean energy funds (state funds to support renewable energy and efficiency, often associated with state electric utility sector restructuring laws) in community development work. Fifteen states have established or are in the process of developing clean energy funds that are slated to collect nearly $3.5 billion from 1998 to 2012 for renewable energy investment.[28] According to Lewis Milford, president of the Clean Energy Group, these funds now finance a variety of projects that help community revitalization and development. Such "funds support green buildings in inner cities, smart school design, and a variety of other sustainable practices that make urban development more attractive." Green buildings can provide a niche market for renewable energy technologies, and the state of Massachusetts, for example, has the largest and most aggressive effort among state energy funds (a budget of $28 million through 2004) to promote the use of renewable energy in green buildings.[29]

Where to Build—Location Matters

Location efficient communities tend to be near commerce centers and transit and encourage a more efficient use of transportation and other infrastructure.

Deciding where to develop within a metropolitan region has been a longtime focus of the smart growth movement, with numerous states passing laws to regulate where growth should occur. These range from Oregon's urban growth boundaries that pose different development rules for land inside and outside a defined border, to Maryland's smart growth law that uses the state budget to direct development to areas with existing infrastructure. These strategies aim to increase "location efficiency," by encouraging development in areas that are close to public services and by discouraging growth in areas not well serviced and/or that have vital natural resources.

In addition to its other benefits, location efficiency reduces energy demand. Location efficient communities tend to be near commerce centers and transit and encourage a more efficient use of transportation and other infrastructure. Location efficiency is viewed as such a critical factor for influencing transportation choice that Fannie Mae is offering homebuyers in some transit rich areas larger mortgages than they normally would qualify for on the grounds that such individuals would own fewer automobiles and drive less.[30] Typically, transportation expenditures are the number two household expense after the cost of housing. With reduced transportation costs, homeowners have more money to spend on home mortgage payments.

Location also can reduce the amount of energy needed for heating buildings, as more compact communities tend to have more compact housing. Nevertheless, transportation energy savings followed by other infrastructure savings tend to be the greater energy gains related to location.

Location Efficiency and Transportation Energy Usage

Programs to reduce U.S. energy usage (particularly the use of petroleum) must directly confront the challenges of the transportation sector. Transportation is second only to industry as the single largest user of energy and is by far the largest consumer of petroleum (97 percent of the U.S. transportation sector is dependent on petroleum fuel). Transportation emissions are a major source of air pollution, greenhouse gas emissions, and public health problems (e.g., asthma and other respiratory problems). Not only is transportation a significant energy consumer, it is also the fastest growing sector.

Recommendations to reduce the amount of energy (fossil fuels) consumed by the U.S. energy sector include: (1) changing travel behavior to favor less energy intensive alternatives; and/or (2) increasing the fuel efficiency of transportation vehicles and/or use alternative fuels.

Unfortunately, the United States has made little progress in recent years increasing vehicle fuel efficiency; the average fuel economy of new cars is lower now than it has been in two decades. Some new technology options, such as gasoline hybrid electric vehicles, and buses fueled with natural gas or biofuels, show great promise. The number of such vehicles continues to be dwarfed, however, by the ever-popular sport utility vehicles and light trucks that compose about one-half of all automobile sales.

A new study conducted in the Toronto area, commissioned by the Neptis Foundation, reveals that housing costs and travel costs tend to increase as one moves away from the central cities.[31] In addition, data collected in the Puget Sound region indicate that vehicle trips decline while transit and pedestrian trips increase when density approaches around 20 dwelling per acre. Residential density is also a good indicator for understanding the relationship between the built environment and air pollution. Carbon dioxide and NO_x (a precursor of ozone) decline steadily as street connectivity and residential and commercial density increases.[32]

Ample research demonstrates that changes in land use patterns have a significant impact on travel behavior. Encouraging smarter land use patterns, in tandem with increased public transportation investments, is a worthwhile policy option that could provide energy benefits as well as social, financial, and public health paybacks (e.g., walking instead of driving provides opportunities for exercise, an area of increased interest for the Center for Disease Control and the Robert Wood Johnson Foundation).

Initiatives to reduce automobile use would be well-served by placing greater attention to smarter land use policies. For example, highway vehicles (mainly passenger cars and light trucks) currently account for more than 70 percent of transportation energy usage and carbon emissions. Automobile travel has increased substantially over the past few decades, far outpacing population growth. From 1980 to 1997, vehicle-miles traveled (VMT) grew by 63 percent—an increase nearly three times that of the population growth during the same period.

While shifting demographics have contributed to additional cars on the road, over 60 percent of the growth in driving and associated forms of energy consumption has been due to land use factors, according to the U.S. Department of Transportation.[33] Spread-out patterns of development have led to an increase in the number of car trips made, as well as in the average trip distance. According to the Surface Transportation Policy Project, using data from the Texas Transportation Institute, the increase in driving is largely due to: longer average trips; a reduction in carpooling; and the decision to drive instead of walk, bike, or use public transit.[34]

Numerous studies indicate that the energy used for the transportation of people is closely linked to growth patterns, and specifically, urban density. Denser cities also are shown to have lower carbon emissions from transportation. According to Susan Owens in her book, *Energy Planning and Urban Form*, the single most important factor affecting the relationship between urban form and transport energy requirements is the physical separation of activities, determined by both density and the interspersion of land uses.[35] A comprehensive study of three metropolitan areas suggests that neighborhood design has a universal relationship to car ownership and driving.[36] Other research shows that individuals living in higher-density neighborhoods that include pedestrian and bicycle-friendly features, mixed-use design, and convenient access to transit reduce their driving by 15 to 50 percent.[37]

Ample research demonstrates that changes in land use patterns have a significant impact on travel behavior.

From an energy perspective, non-motorized transportation is preferable to motorized travel and public transit is preferable to single passenger vehicles. A recent study indicated that public transportation saves more than 855 million gallons of gasoline per year. According to this report, if Americans used public transportation at the same rate as Europeans—for roughly ten percent of their daily travel needs—the United States would reduce its dependence on imported oil by more than 40 percent, or nearly the amount of oil we import from Saudi Arabia each year.[38] Local businesses and chambers of commerce have realized another benefit of a strong public transit system and a land use pattern that supports its use: its importance for attracting qualified and desirable workers to a region, efficiently moving workers to their jobs, and enhancing local economic development opportunities. Some encouraging signs are evident. Since about 1995, the use of public transit is on the rise and has grown more quickly that the use of private vehicles.

One obstacle to more efficient transportation is the lack of coordination between state and regional agencies involved with transportation planning and local entities engaged in land use planning and community development. A growing number of states and localities, however, are working to improve such coordination that will draw development near public transit and ensure greater use of less-fossil fuel intensive transportation options. Models of integrated land use and transportation planning include: the state of Oregon, the Georgia Regional Transportation Authority, and Arlington County, Va. In addition, transit oriented development (development that occurs within about one-half mile of a transit stop) is effective at reducing vehicle miles traveled when it is linked to a grid of streets that is good for walking and biking, contains a rich mix of uses, uses a variety of housing types, and is a "real" place, not a transportation node.[39] The new Center for Transit Oriented Development will be an important resource for advancing this energy efficient real estate product.[40]

Location and Energy Resources Planning

While integrating land use and transportation planning is a good first step, states and communities could benefit further from the integration of energy resource and land use planning. Joint planning of this type is rarely done, and very few states and localities pay much attention to issues concerning future energy demand or supply in their comprehensive planning process. Land use and energy planning are conducted by separate agencies that rarely coordinate efforts. According to the firm working on the PLACE3S[41] planning model, "energy technical specialists and government decision-makers have difficulty bridging the information gap between them to understand how to effectively introduce energy efficiency and generation opportunities in growth and development decisions."[42]

Of great encouragement is the American Planning Association's (APA) renewed interest in energy planning. A recent edition of their *Planning* magazine featured a story on sustainable energy planning and their December 2002 Planning Advisory Services Memo was devoted to the topic of "Renewable Energy and Energy Efficiency Incentives for Local Government." In addition, the APA recently completed an Energy Policy Guide to advise future work in the energy field.[43] Further, the May 2004 issue of APA's *Planning* magazine includes an article on the Blueprint Program in Sacramento, described in a box on page 13 in this paper.[44] Such increased activity by APA should help to interest a new generation of planners in energy issues.

Planning tools, such as PLACE3S and the Smart Growth Index, can help communities and planners conduct more integrated planning by considering a variety of planning, energy, and environmental issues and assessing the relative impacts of different development scenarios. These Geographic Information Systems (GIS)-based tools hold much promise for helping governments to work with the public on the creation and implementation of resource efficient land use plans.

Some communities and states are leading the way in this area. In light of recent energy shortfalls and utility pricing problems, the California Energy Commission is distinguishing itself by working to encourage localities to include energy considerations in the update of their local comprehensive plans.[45] Other states, such as New York, have begun a more integrated planning process to address the issue of greenhouse gas emissions. In fact, climate change reduction planning provides an excellent new audience for the smart growth message.[46] In June 2002, New York released its Energy Plan that addressed recommendations from Governor Pataki's new Greenhouse Gas Task Force. The Plan calls for: redirecting state transportation spending toward energy efficient alternatives, such as transit, walking, and biking; targeting open space funding to prevent sprawl and reduce vehicle miles traveled; and working with regional and local planning bodies to better document carbon dioxide emissions and energy use of different transportation plans and programs.[47] In May 2004, Massachusetts unveiled its comprehensive climate change plan, making it the first state to base its transportation planning and funding projects, in part, on the greenhouse gases such projects would produce. In addition, some municipalities, such as Portland, Ore., are engaged in sustainable energy planning, which seeks to integrate building, transportation, and land use issues.

Integrated Planning in Sacramento:

The Blueprint Progam

The Sacramento Area Council of Governments has embarked on a land use, transportation, and planning program to assist the region in adopting long-term growth plans and policies. Citizens, elected officials, business owners, developers and environmentalists from 26 city and county governments will attend a total of 38 public workshops. Using the Internet-accessed PLACE3S technology, local input is scaled up to form county and regional alternatives for further citizen review and input. Citizens can see their own neighborhood input in the plan, while gaining a better understanding of the value of a well-informed regional strategy. According to the state energy commission, the PLACE3S program meets the information needs of professional planners yet is fast enough to satisfy the time limits of hands-on public involvement. PLACE3S software can be expanded by adding new modules as they are developed. For example, the land use and travel analysis capacity has been expanded several times to more accurately account for smart growth options, redevelopment economics have been embedded in neighborhood level scenario planning tools, and soon full energy demand and distributed generation capability will be completed, tested, and added to the public domain Internet site for all users' to share. Sacramento's "Blueprint Program" and the PLACE3S Internet-accessed scenario planning tool are changing the way regional policy in developed in California – and perhaps, the country. (See www.sacregionblueprint.org for more information.)

Renewable Energy

Renewable energy can increase community livability by replacing dirtier fossil fuels and reducing disruptive power outages through on-site, back-up generation. Alternative and renewable energy technologies are versatile and can be used on a building or neighborhood scale, or produce energy that is sold back to the electric grid. Popular renewable energy technologies include:

- ***Solar*** *- Energy derived from the sun that can be used passively or converted to electricity;*
- ***Geothermal*** *- Using the Earth's natural underground heat, geothermal energy is able to produce electricity from an unlimited renewable source that produces virtually zero pollution;*
- ***Wind*** *- Stand-alone wind turbines can be used for individual home applications, helping supplant fossil fuels and reducing electric bills. Wind plants employ multiple turbines to produce utility-scale electricity;*
- ***Biomass*** *- Derived from organic materials and waste products, biomass energy is able to produce renewable energy in many different forms;*
- ***Cogeneration*** *- Uses waste heat to produce thermal energy; and*
- ***Hydrogen Power*** *- Produces energy without emitting pollutants (except when hydrogen is made from natural gas) through the process of burning or chemically-reacting hydrogen.*

For more information on renewables and incentives to promote renewable energy, see www.dsireusa.org.

Opportunities for Funders

Energy issues have become increasingly important public policy drivers. Whether talking about climate change, health, economic development, or foreign policy, energy is often at the root of the problem. It is increasingly important, then, to consider energy factors in far-reaching decisions concerning land use, transportation, and community design. Energy efficient design should play a key role in restoring and sustaining American cities. The Apollo Alliance, a coalition of environmental and labor organizations, believes the combination of smart growth and renewable energy has the potential to be a new economic engine for this country. Through more effective and integrated planning, healthier and more comfortable communities that can weather energy shortfalls, price increases, and shifts to new energy sources can be created.

Funders can play an important role in facilitating a better marriage between these two movements and determining how one can benefit from the other and address barriers. The following section describes how funders can facilitate a stronger connection between the energy and smart growth communities in the areas of research, planning and practice, policy, and investment.

1. Research – Increasing Transparency and Information Disclosure

Funders can play an important role in arming planners, developers, and consumers with comprehensive information to make smart decisions about building and community design. The lack of transparent information on the true costs of sprawl development and the relationship between land use patterns, transportation, and energy have led to inaccurate price signals and poor housing choices. Traditionally, funders have supported research in either the energy/climate change field or the land use/smart growth arena. Research and information disclosure that bridges the gap between these two movements is critically needed. In addition, funders can help promote the inclusion of energy efficient practices and the use of cleaner, renewable energy sources within the smart growth movement and its messages.

New measurements on travel and energy efficiencies would be extremely useful to planners, developers, and consumers. Bringing the research on energy and greenhouse gas emission benefits of good community design to the same standard as current research on travel demand is particularly needed. Prospective home buyers could use such data to better assess the affordability and value of a house. To ensure this information is disclosed to homebuyers, funders could support partnership projects linking smart growth and energy planners with the National Association of Realtors and local realtor organizations. Such organizations would have the clout and access to promote realtors' routine dissemination of energy and transportation information. For example, it would be helpful for realtors to tell prospective homebuyers how long it will take them to drive to work during a typical rush hour, as most homebuyers tour homes on the weekend, which is not a good indicator of daily traffic. Mortgage brokers could also be employed to discuss comparative energy costs with clients. A cost calculator, available on the web, would be another effective way for consumers to access such information.

Funders could also facilitate the delivery of information on how to coordinate good locations with good building design to professional planners, developers, and builders. Many existing green buildings are located in suburban locations and there is a lack of knowledge on how green buildings and renewable energy can be integrated into urban locales. Research and information on optimizing location, energy efficient design, and the use of renewable energy—and any trade-off or pitfalls involved—would be valuable in the hands of planner and developers.

2. Planning and Practice

Perhaps the most significant way funders could promote energy smart growth is by supporting on-the-ground projects. Planning and decision-making support tools that integrate land use with transportation and energy planning are extremely valuable for putting the energy smart growth connection into practice. Funders can help support the continued upgrade, development, dissemination, and availability and awareness of tools such as PLACE3S, INDEX (an interactive scenario evaluation tool for land use transportation planning), EPA's Smart Growth INDEX (that allows for greater comparison of development scenarios on the basis of environmental indicators), and CityGreen (that analyzes vegetation, air quality, and stormwater conditions). Written reports of tool application, presentations, and best practices guides would be extremely useful, as would support for participatory planning sessions that utilize these tools, such as Sacramento's Blueprint Project (see page 13). Funders also could support integrated planning efforts that use simpler, less high-tech approaches. These tools and others are profiled at www.placematterstools.com.

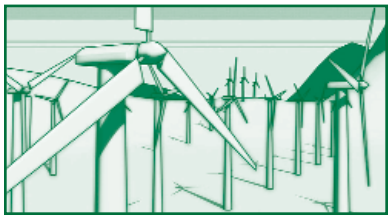
Because of the rapid growth of the renewable energy industry, communities and states could use assistance in evaluating the local renewable energy potential of their area. The writing of local renewable resource assessments, that could draw on data collected by the Department of Energy and other sources, would be extremely beneficial, as would financial support that would help underwrite the completion of such assessments.

To assist the implementation of integrated planning and practice, funders can play an important role in encouraging increased communication and partnerships among land use planners, developers, community development experts, architects, lenders and those in the energy, climate change, and green building fields. Some examples of exciting new partnerships worthy of attention are the new LEED Neighborhood Design partnership (described on page 8) between the Congress for the New Urbanism (CNU), Natural Resources Defense Council (NRDC), U.S. Green Building Council (GBC), and the new American Institute of Architects (AIA) partnership with the Department of Energy (DOE). The AIA has partnered with the DOE to promote buildings conducive to resource efficiency and to advocate an increase in renewable and clean energy sources. The DOE also is working with local governments to link solar energy technologies to brownfields redevelopment. Ways to encourage partnerships include supporting the establishment of crosscutting, multi-agency task forces, energy/smart growth forums, or sustainability symposia; funding projects that involve both energy and smart growth organizations; and building the capacity of local governments to help implement these integrated efforts.

Funders also have the ability to support the growth of the labor-environmental alliance, as a means to boost jobs and the economy within the context of smart growth. For example, one recent development is that the Apollo Alliance (composed of environmental and labor groups), which believes that smart growth, in tandem with energy efficiency and renewable energy resources, will lead our nation to not only economic security, but also economic prosperity. Such coalitions have the opportunity to emphasize energy-smart growth as a new economic driver for the country.

3. Policy

Funders can play a key role in supporting policies that advance the energy smart growth agenda. This includes supporting organizations advocating for federal legislation that promote this integration, such as integrated metropolitan planning, transit oriented development (e.g., all the new development projected for the Washington, D.C., area over the next 25 years could be accommodated within a one-quarter mile around existing transit stations[48]), and public transit; incentives for renewable energy in energy bills; making smart growth and energy a proper object of welfare and housing policy; and including provisions for mixed-use developments and improved community design in travel to work poli-



cies. Location efficiency could be promoted as a screen for locating publicly assisted projects and for deciding on whether to publicly assist private ones. Funders could also help support the implementation of the energy title in the farm bill, including education for farmers on the use of open space to produce energy.

On the state and local level, funders can help to support the improvement of building codes for energy efficiency—and help to make improved building design standards an integral part of smart growth. Over 20 states have not adopted mandatory energy codes for new residential and commercial buildings or have out of date codes. The International Energy Conservation Code could serve as a minimum standard and/or other models could be more appropriate. Better enforcement of codes such as California's requirement for solar orientation, is also needed. Currently, an inadequate number of code officials monitor one to two million new housing starts per year. Improved building design standards (e.g., EPA Energy Star standards) should automatically be part of smart growth and barriers to the use of solar panels on roofs should be eliminated.

Location efficient and energy efficient mortgages, which provide better financing arrangements for housing close to transit, or with high home energy ratings, give prospective homeowners added incentive to buy efficient homes.

Funders can help to support local policies that provide additional incentives for developers and builders to include energy smart design features. For example, local governments could build location and energy efficiency into plan reviews. Buildings meeting certain criteria could accelerate through the design review process, and/or receive other benefits, such as bonus densities, or better financing. The state of Maryland, for example, has launched a new $25 million tax credit program to provide incentives for developer to build or retrofit energy-efficient commercial buildings. The tax credit, which can only be used in designated growth (priority funding) areas, will help offset higher costs that may be associated with the design and construction of green buildings. Funders can play a critical role in supporting the development of innovative policies, which identify and reward developers who pursue energy efficient, smart growth type developments. Such policies will provide the weight needed to tip the market toward the institutionalization of energy smart growth.

Another important aspect with regard to policy and investment is support for policies that encourage the growth of the renewable energy industry. These policies, such as Renewable Portfolio Standards and Renewable Production Tax Credits, are critical tools for encouraging investments in solar, wind, biomass, and geothermal. Also important is removing unfair barriers to connecting distributed energy to the grid through interconnection and "net metering" clauses.

Finally, funders can help get green building and energy-smart concepts integrated into existing policies and charters. The Smart Growth Network principles, for example, list many actions that can, indirectly, save energy, such as "create walkable communities;" however, energy is not referred to directly. The Charter of the Congress for the New Urbanism mentions energy; however, energy could be further stressed by inclusion in the preamble and by discussion of solar orientation and energy efficient building design.

4. Investment

In addition to the policies stated above, funders can play a critical role in cultivating the lending community to support the implementation of energy smart growth. Partnering with state clean energy funds to conduct educational sessions and undertake pilot programs with big lending institutions could be an effective way to mainstream this support. Energy smart growth criteria could become a requirement for loaning practices and policies. New accounting standards, that include energy smart criteria, could be included in bond ratings.

Location efficient and energy efficient mortgages, which provide better financing arrangements for housing close to transit, or with high home energy ratings, give prospective homeowners added incentive to buy efficient homes. Examples such as Fannie Mae's Location Efficient Mortgages (LEM) and Energy Efficient Mortgages

(EEM), and Washington, D.C.'s SmartCommute Mortgages, reward consumers by qualifying them for larger loans on the grounds they will pay less for transportation and/or home energy costs.

Funders could also use their power to encourage greater government investment in energy efficiency and renewables to overcome market barriers. Multi-year renewable energy tax credits (versus single year) will provide investors additional confidence. Funders could also help to publicize and eliminate wasteful subsidies for the fossil fuel industry so that renewables can play on an even playing field. The U.S. government provided tax incentives worth about $140 billion to oil companies from 1968 to 2000.[49]

On a local and state level, funders can help support efforts to examine and adjust current utility pricing so that residents in outlying areas cover the true costs of supplying energy. San Diego has implemented impact fees that are higher for those in more distant locations, and New Jersey has proposed regulations to end subsidies to developers extending power lines in sprawl areas. Funders also can help direct local clean energy funds money (from electricity deregulation) to support energy efficient community development work.

Rural Areas, Smart Growth, and Energy Efficiency

Unique Issues to Consider in Rural Communities

Rural areas have some unique issues to consider when exploring the energy-smart growth connection. Funders can assist rural communities in researching these topics, such as the ones listed below:

Generation of Power from Wind and Solar Sources

Due to abundant open space, rural areas are uniquely suited for renewable energy generation. It is important for rural communities to investigate how best to take advantage of these resources, which also can serve to stimulate local economic development. By leasing land for the generation of wind power, for example, farmers can continue to farm their land while earning extra income from power generation. This new source of income can assist struggling farmers to keep their land in agriculture, rather than selling it for residential or commercial development. The U.S. Farm Bill has an energy provision that provides incentives to farmers for generating energy. Funders can support educational programs that assist farmers and rural communities to take advantage of these energy provisions.

Renewable Energy, Farms, and Solar Innovation

The use of renewable energy on farms also can serve as an excellent source of back-up power to support modern farming. California farmers, for instance, turned to solar back-up generation to mitigate the effects of blackouts. Power outages would often occur on hot, dry days when electricity was most needed to power irrigation systems. A patented box allowed for the integration of solar and electrical power. When the power grid was operating normally, the box sent excess power to the utility. If the power failed, the box shut off its utility connection, and routed electricity to irrigation. Unlike an investment in diesel generators, solar systems can operate all the time and pay for themselves with excess power sold back to the local utility. (Teresa Riordan, "Using the Sun to Stop Blackouts," The New York Times).

Caution for Rural Areas

Rural areas must also consider the ill effects that small-scale, distributed generation could have on development. Such systems, such as fuel cells, could allow for community development in remote areas far from the electric grid. This phenomenon could lead to additional sprawl. Rural communities should ensure other policies are in place to discourage sprawl development.

Conclusion

The energy efficiency and smart growth movements have a unique opportunity to come together at this time to capitalize on the momentum that each is currently experiencing. Combined, the two fields have the opportunity to promote greater change and awareness than they may be able to accomplish individually. Incorporating considerations about energy efficiency into smart growth decisions about how and where we build could result in economic benefits as well as further enhance the idea of livable and walkable communities. The four areas of opportunity for funders presented here—research, planning and practice, policy, and investment—have the potential to overcome the barriers that currently exist between the two movements. The time is right for a new collaboration.

Endnotes

1. Naomi Friedman is a consultant to the Environmental and Energy Study Institute (EESI) and the director of sustainable markets at the Center for a New American Dream. Assistance and review were provided by Carol Werner, EESI; Scott Bernstein, Center for Neighborhood Technology; Joe Schilling, International City/County Management Association (ICMA); Deron Lovaas, Natural Resources Defense Council (NRDC); and Jim Schulman, Sustainable Community Initiatives. Additional comments were provided by Cameron Brooks and Lew Milford, Clean Energy Group; Hooper Brooks and Marisa Buchanan, Surdna Foundation; Joe Carpenter, New Jersey Department of Environmental Protection; Josh Green, Massachusetts Technology Collaborative; Nancy Hanson, California Energy Commission; Megan Lewis, American Planning Association; Jim Mann and Ed Miller, Illinois Clean Energy Community Foundation; Richard Mappin, Berks County Community Foundation; Rob Sanders, The Reinvestment Fund; Lee Schipper, World Resources Institute; Shelley Shreffler, The McKnight Foundation; Randall Solomon, New Jersey Bureau of Public Utilities; and Peter Templeton and Jennifer Henry, U.S. Green Building Council.
2. "Green space" in this paper includes farmland, parkland, wooded areas and habitat, and village greens.
3. Jim Schwab, "Who's Got the Energy?" *Planning*, American Planning Association, October 2002.
4. John Cogan, Energy Information Administration, U.S. Department of Energy, Washington, D.C., personal communication (December 10, 2001). For more details, see www.eia.doe.gov.
5. "Oil Supplies Fall as Nation Shivers," *The Christian Science Monitor*, January 23, 2003, page 1.
6. Richard Gilbert, *Energy and Smart Growth: An Issue Paper*, Neptis, 2002, page 9. Per capita consumption of energy in North America is ten times that of Asia and Africa. (United Nations Development Programme, *World Energy Assessment: Energy and the Challenge of Sustainability.* New York: United National Development Program, 2000, as quoted in Howard Geller, *Energy Revolution: Policies for a Sustainable Future.* Washington, DC: Island Press. 2003.) Iceland, Luxembourg, and Canada use more total energy per capita than do U.S. citizens (Gilbert, 2002).
7. Figures are for 2000.
8. Oil imports have increased significantly over the years. In 1990, the United States imported 42 percent of our oil, and in 1980, it imported 37 percent. The EIA, *Annual Energy Outlook 2003*, USDOE, January 2003.
9. William Fulton, Rolf Pendall, Mai Nguyen, and Alicia Harrison, *Who Sprawls Most? How Growth Patterns Differ Across the U.S.*, Center on Urban and Metropolitan Policy, The Brookings Institution, July 2001.
10. E.M. Risse, *The Shape of the Future*, Volume 1 and Volume II (Virginia: Synergy Resources, 2000), page 519.
11. Electricity transmission and distribution networks are expensive to build, and energy loses are significant. One utility company estimates that it spends $1.50 to deliver power for every $1.00 that it spends producing it. According to Jim Dodge, a member of the Board of Directors of GrowSmart Rhode Island and former CEO of New England Power, concern about energy distribution inefficiencies drove him to embrace the goals of smart growth. According to Mr. Dodge, his company wanted to build a gas pipeline through Vermont and on to Montreal. He soon realized, however, that delivering natural gas to sprawled communities was an extremely expensive proposition. The company needed a certain density to make energy distribution efficient, and

hoped that industrial customers would help subsidize the cost of delivering energy to residences. Jim Dodge, personal communication, 2002.

12. A greenfield is defined as undeveloped property, sometimes in agricultural or forestry use, located on the edges of or outside of existing urban areas, frequently targeted for suburban development.
13. A brownfield is defined as an industrial or commercial parcel that is abandoned or underused and often environmentally contaminated, especially one considered as a potential site for redevelopment.
14. A greyfield is defined as an obsolete or abandoned retail or commercial site, usually a shopping mall.
15. Bob Burns, National Regulatory Research Institute, Ohio State University, Columbus, Ohio, personal communication, May 22, 2003. Beyond the scope of this paper is a discussion of electricity restructuring and how such policies may reduce local control over the delivered cost of energy and incentives for conservation.
16. The U.S. Forest Service estimates that an average tree absorbs up to 26 pounds of carbon dioxide per year, which is the amount emitted by a car traveling 11,300 miles. In 1999, U.S. forests sequestered enough carbon dioxide to offset approximately 15 percent of U.S. carbon dioxide emissions. U.S. Forest Service, as quoted in www.coolcommunities.org/urban_shade_trees.htm as quoted in National Governors Association, *Growing with Less Greenhouse Gases* (Washington, DC, NGA), Fall 2002, p. 14 and Richard A. Birdsey, *Opportunities to Increase Carbon Sequestration Through Forestry*, USDA Forest Service, Global Research Program, Senate Agriculture Committee Seminar, Washington, DC, March 2001, as quoted in NGA, p. 14. Most of the potential for carbon sequestration, however, is in tropical and subtropical regions.
17. G. Patrick Stoner, Program Director, Local Government Commission, presentation and personal conversation, Partners for Smart Growth Conference, New Orleans, January 2003. Cost savings were incurred through deferred pavement costs, reduced cooling costs through additional street shading, and the ability to site additional lots using north/south orientation.
18. Steve Bodzin, Congress for the New Urbanism, personal conversation, August 2002.
19. EESI, "High Performance School Buildings: Energy-Smart Schools that Make a Difference," Congressional briefing summary, September, 2001, www.eesi.org.
20. For example, data from Sacramento, Calif., indicated that new urbanism type dwellings in Metro Square, a 46-unit town home project, significantly outperformed a more conventional 46 unit urban subdivision in reduced energy use and greenhouse gas emissions. The more conventional development used 176 MMBTUs of energy per capita per year, while the Metro Square development used only 110 MMBTU. Eliot Allen, "More Urban is Better for the Earth, Data Shows," in New Urban News, June 2002. Another analysis performed by Criterion Planners using the INDEX software, found that three "test" neighborhoods outperformed the conventional neighborhoods on energy efficiency due to higher residential densities, more common walls, and ceilings that reduce energy losses from the building. (Higher densities also encouraged travel energy savings through greater walking, biking, and transit use). Using some additional, relatively minor energy efficiency features such as more energy efficient building design and tree plantings, homes were able to achieve up to 15 percent more reduction (over California State Title 24 requirements). The additional trees planted in certain test neighborhoods resulted in carbon dioxide update increases up to 25 percent. Modeling performed for Chula Vista, Calif.
21. Energy Star qualified homes are independently verified to be at least 30 percent more energy efficient than homes built to the 1993 national Model Energy Code or 15 percent more efficient than state energy code, whichever is more rigorous. These savings are based on heating, cooling, and hot water energy use and are typically achieved through a combination of features, such as: building envelope upgrades, high performance windows, controlled air infiltration, upgraded heating and air conditioning systems, tight duct systems, and upgraded water-heating equipment. http://www.energystar.gov/index.cfm?c=new_homes.hm_earn_star.
22. Glen Chinery, EPA Energy Star Program, personal communication, June 2003.
23. Nigel Howard, U.S. Green Building Council, personal communication, June 2003, www.usgbc.org.
24. See, "Building Green: Buyers Show Interest, But are they Willing to Pay?," in *On Common Ground: Realtors and Smart Growth*, Winter 2004, twright@realtors.org.
25. The Trust is building energy efficient/renewable energy single-family homes in reclaimed city lots near bus lines in Chicago. Environmental Resources Trust, personal communication, February 2003.
26. National Consumer Law Center, *Energy and the Poor: The Crisis Continues*. Boston, MA: National Consumer Law Center, 1995, as quoted in Geller, Energy Revolution, pages 5-6.
27. Motoko Rich, "Green Gets Real with Affordable Housing and Affordable Bills," *The New York Times*, May 6, 2004.
28. Ryan Wiser, Mark Bolinger, Lewis Milford, Kevin Porter, Roger Clark, *Innovation, Renewable Energy and State Investment: Case Studies of Leading Clean Energy Funds*, Ernest Orlando Lawrence Berkeley National Laboratory, September 2002, LBNL-51493, http://eetd.lbl.gov/EA/EMP/. USDOE National Renewable Energy Laboratory, *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*, September 2002.
29. Lewis Milford, Clean Energy Group, personal communication and Lawrence Berkeley Laboratory, *Innovation, Renewable Energy, and State Investment: Case Studies of Leading Clean Energy Funds*, September 2002, http://eetd.obl.gov/EA/EMP/.
30. For more information, see www.locationefficiency.com.
31. Laurie Monsebraaten, "Life in Suburbia Costs More than You'd Think: Commuting, Home Maintenance Drive Up Expenses," *Toronto Star*, January 25, 2004.
32. Lawrence Frank and Company, "Achieving Sustainability through Health Community Design," King County Land-Use Transportation/Air quality Health Study.
33. U.S. EPA, *Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation, and Environmental Quality*, EPA 231-R-01-002 (January 2001).
34. "Why are Roads so Congested: A Companion Analysis to the Texas Transportation Institute Data on Metropolitan Congestion," (Washington, DC: Surface Transportation Policy Project, November 1999).
35. Susan Owens, page 32. Research also indicates that the number of vehicles used is an important factor for determining total vehicle miles traveled. Reducing the number of cars owned per household is an important way to reduce VMT's. (Richard Gilpert, "Energy and

Endnotes (cont.)

Smart Growth: An Issue Paper," Neptis, October 2002, page 26). *Measuring Sprawl and its Impact* concurs that in the ten most sprawling metropolitan areas, there are on average 180 cars to every 100 households, while in the least sprawling areas, there are 162 cars to every 100 households.

36. John Holtzclaw, et al, "Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles and San Francisco," in *Transportation Planning and Technology*, 2002, Vol. 25, pp. 1-27.
37. For additional discussion of community design, vehicle miles traveled, and transportation energy usage, see: U.S. EPA, *Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation, and Environmental Quality*, EPA 231-R-01-002 (January 2001); Making the Land Use Transportation and Air Quality Connection (LUTRAQ), prepared for Thousand Friends of Oregon, see Vol. 5, http://friends.org/resources/lut_reports.html; the National Governors Association, *New Community Design to the Rescue: Fulfilling Another American Dream.* Washington, D.C., (2001), pp. 36–37; Bennet Heart and Jennifer Biringer, The Smart Growth-Climate Connection, Boston, MA, Conservation Law Foundation (November 1, 2000), and the website at www.tlcnetwork.org/Smart_Growth_Climate_Change_Connection.html; and Peter Newman and Jeffrey Kenworthy, *Sustainability and Cities: Overcoming Automobile Dependence*. Washington, D.C.: Island Press (1999).
38. Robert Shapiro, et al, *Conserving Energy and Preserving the Environment: The Role of Public Transportation*, commissioned by the American Public Transportation Association, July 2002.
39. Scott Bernstein, Center for Neighborhood Technology, personal communication, Dec. 2003.
40. For more information, see www.reconnectingamerica.org/html/TOD/.
41. In 1994, the California Energy Commission teamed with the state energy offices in Oregon and Washington and with consultants in Portland, Ore., to initiate the Planning for Community, Energy, Economic and Environmental Stability (PLACE3S) model. PLACE3S contains a database that includes an accounting of a community's growth forecast, and can be used to create maps showing where, when, and what type of future energy demand can be expected. The original tool has been improved over the years, and energy demand can now be disaggregated by sector, fuel type, and location. Plans are to further expand the tool to include a "Local Government Energy Option Matching Module," (or Energy Calculator) that will provide greater ability to identify energy generation technologies for different land uses and assess the benefits of different development patterns.
42. Parsons, Brinckerhoff, Quade, and Douglass, et al, "PLACE3S Energy Option Matching Module: Project Summary Report," draft, July 2002, prepared for the California Energy Commission.
43. www.planning.org/policyguides.draftenergy.htm.
44. www.planning.org.
45. Nancy Hanson, California Energy Commission, personal communication.
46. As of June 2002, 27 states had developed or were in the process of developing climate action plans and 129 U.S. municipalities are participating in the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Change Protection, setting specific goals for greenhouse gas reduction, activities and benchmarks.
47. *State and Local Climate Change Policy Actions*, The Center for Clean Air Policy, October 2002, p. 14 www.nyserda.org/sep.html.
48. Coalition for Smarter Growth, *Blueprint for a Better Region*, www.smartergrowth.net.
49. General Accounting Office, Tax Incentives for Petroleum and Ethanol Fuels. GAO/RCED-00-301R. Washington, DC: U.S. General Accounting Office as quoted in Geller, page 38.

Funders' Network
For Smart Growth and Livable Communities

Jon Jensen, Chair
L. Benjamin Starrett, Executive Director

Strengthening and expanding funders' abilities to support organizations working to build more livable communities through smarter growth policies and practices.

1500 San Remo Avenue, Suite 177
Coral Gables, Florida 33146
Phone: 305-667-6350
Fax: 305-667-6355
E-mail: info@fundersnetwork.org
www.fundersnetwork.org